# St. Bartholomew's Hospital Journal.

VOL. X.—No. 8.] MAY, 1903. [PRICE SIXPENCE.

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## St. Bartholomew's Hospital Journal,

*MAY*, 1903.

"Æquam memento rebus in arduis
Servare mentem."—*Horace*, Book ii, Ode iii.

## Three Lectures on the Principles of Disinfection.

*Delivered at the beginning of the Summer Session by*

F. W. ANDREWES.

### LECTURE I.

THE importance of disinfection in modern medicine and surgery is beyond dispute. With the acceptance of the "germ theory" of infective disease, the destruction of germs evidently takes a foremost place in the practical treatment and prevention of such diseases. The subject of disinfection is therefore worthy of your careful attention. It is one concerning which much ignorance and superstition prevail, not only amongst the general public, who are the victims of shameless advertisement, but even amongst medical men who ought to be well-informed on the matter. The reasons for this are not far to seek. The problems of disinfection are in themselves difficult and complicated, for they involve the action of physical and chemical agencies upon objects too minute to be seen by the unaided eye, and recognisable only by their effects, which may not be apparent for days or weeks. And these agencies are called upon to act under diverse physical conditions, some of which profoundly modify their influence. It is no wonder that we often go astray. I propose to devote three lectures to the principles of disinfection, and to the practical methods by which they may be carried out. I do so with the full consciousness of my inability to deal adequately with the subject: at the most I can endeavour to point out the cardinal facts upon which the rational employment of disinfectant measures should be based.

The term "*disinfection*" implies the destruction of the germs of infective disease. The term "*sterilisation*" means more than this, for it implies the destruction or removal of all forms of organic life. The very great majority of the germs which are concerned in infective disease belong to the group of bacteria. A few are yeasts and moulds, and a few are known to belong to the animal kingdom, but we may practically neglect these, because their resistance to disinfectant agents is less than that shown by bacteria. The problems of disinfection are essentially concerned with the destruction of bacteria, and to this I limit what I have to say.

There are certain bacteria which have the property of forming "*spores.*" Spore formation amongst bacteria (though not amongst the higher fungi) is not so much a mode of reproduction as the passage into a highly resistent "resting stage." It is a device whereby the bacterium is enabled to tide over adverse physical conditions—such, for

instance, as desiccation—until the surroundings are again favourable for growth and activity. The living protoplasm of the bacterium surrounds itself with a thick impermeable capsule, which presents such a barrier to the evaporation of moisture, to heat, and to injurious chemical agents, that spores are, of all known forms of living matter, the most difficult to kill. Non-sporing bacteria present no such extreme resistance: they are not harder to kill than other lowly forms of vegetable life.

From this it follows that there are two grades of disinfection. It is possible to employ means so severe that even spores are killed, and this is called "*complete disinfection.*" Or means may be used which are of less severity, sufficient to kill the non-sporing or "vegetative" forms of bacteria, but inadequate for the destruction of spores: this is "*incomplete disinfection.*" The distinction is one of practical importance. If it were possible one would always prefer to use means of complete disinfection, so as to be on the safe side. But it is not always possible. We cannot in actual practice attempt the destruction of spores in wounds or living tissues, because the spores are so very much more resistent than the tissue cells, that we should cause wide-spread injury. In certain cases of grave risk this may be good treatment—the actual cautery is used for the bite of a rabid dog; but it is no part of ordinary surgical treatment. The only region of the human body in which complete disinfection may be reasonably attempted is the intact skin, where the surface cells are already dead and horny; even here it is not easy to attain. Apart from the living body it is usually right to aim at complete disinfection, which is commonly possible, even without serious damage to the material to be disinfected.

It is, however, worth while to pause for a moment to consider the circumstances under which complete disinfection is imperative, and those under which incomplete disinfection may really be all that is needed. The number of bacteria which form true spores is comparatively limited. No micrococci form them at all, and only a small proportion of the bacilli. When we consider the bacteria which are pathogenic for man we find that those which are known to form spores may be numbered almost on the fingers of one hand. The anthrax bacillus forms spores, and so does the tetanus bacillus, together with certain other anaërobes, such as the bacillus of malignant œdema. These are infections which are hardly ever transmitted from man to man, and cannot, without gross carelessness, be conveyed to the wound at a surgical operation. It follows that the circumstances under which complete disinfection is known to be absolutely imperative are few and far between. Too much reliance must not, however, be placed on this. There are a good many human infections in which the infective agent is not yet discovered: some of these may ultimately prove due to spore-bearing organisms. Some of the pathogenic organisms we already know may secretly form spores, though we have never found it out. There is at least one specific fever—smallpox—in which there is some possibility that the infecting agent is a spore-bearing bacillus. It is therefore a safe general rule that one should aim at complete disinfection wherever it is practicable.

Nevertheless it is useful to know in what diseases "incomplete" disinfection may be adequate. There are a good many in which the infecting agent is very well known, and has been cultivated and studied for so many years that, did it form spores, the fact would almost certainly have been discovered. The following is a list of the chief human infective diseases in which the infecting organism is quite well known, and in which there is a reasonable certainty that it does not form spores:

Typhoid fever, Malta fever, Asiatic cholera, bubonic plague, diphtheria, glanders, acute pneumonia, epidemic cerebro-spinal meningitis, erysipelas, cellulitis and lymphangitis, septicæmia and pyæmia (in their common forms), malignant endocarditis, suppurations and abscesses (in their common forms), gonorrhœa.

In this list are included certain morbid conditions, such as suppuration and septicæmia, which are not specific diseases, but may be due to a variety of infecting agents. It would be untrue to say that these are never due to spore-bearing organisms, for the anthrax bacillus may cause a septicæmia. But they are almost always due to organisms which are incapable of forming spores. In the treatment and prophylaxis of all the diseases in the above list—and it is to be noted that it includes not only many important fevers, but also those conditions which the surgeon and obstetrician have the most reason for dreading—there is reasonable safety in measures directed against non-sporing organisms only.

The list might be considerably extended if we were prepared to act upon probabilities short of actual certainty. There are a number of fevers in which the infecting agent is strongly suspected, but in which the crucial proof is lacking; and there are others in which, although the actual infecting agent is unknown, its resistance is known to be small. The following subsidiary list comprises diseases in which there is a presumption that the infecting agent forms no spores:

Typhus, relapsing fever, scarlet fever, measles, Rötheln, influenza, whooping-cough, mumps, rheumatic fever, dysentery, rabies.

In the diseases in this second list we must recognise that, if we are content with measures of incomplete disinfection, we are acting only on probabilities. Complete disinfection would be safer.

No mention has been made in either of the above lists of the infective granulomata, or of the parasitic skin diseases due to fungi. Actinomycosis is due to various species of Streptothrix, which appear to form spores of a kind analogous to those of the moulds rather than to true

bacterial spores. These, and the parasites of ringworm and favus, are, so far as is known, intermediate in their resistance between bacterial spores and non-sporing bacteria. The tubercle bacillus is not proved to form spores though this may be the case. Its resistance is somewhat greater than that presented by ordinary non-sporing bacteria, but inferior to that of true bacterial spores. It is probable that what is true of tubercle is true also of leprosy and syphilis. In all these diseases it is desirable to aim at complete disinfection. Yellow fever and malaria are conveyed, so far as is known, by gnat bites only, and are not considered here.

I have thought it needful to dwell at some length on these points, in order that we might approach the subject of disinfection with an intelligent appreciation of the kind of germs we intend to destroy. We must now review the means at our command for their destruction or removal. These means include mechanical cleansing, physical agents such as heat, light, and electricity, desiccation, and the action of chemical poisons.

*Mechanical cleansing.*—There are many pathogenic bacteria which infest the healthy human body. Practically all the common organisms concerned in suppuration are normally found on the skin and mucous surfaces of the body: such are *Staphylococcus pyogenes aureus* and *albus*, and *Streptococcus pyogenes*. *Bacillus coli communis* swarms in the healthy intestine. *Diplococcus pneumoniæ* is a frequent inhabitant of the mouth. All these are not living as parasites in the tissues, but as saprophytes in the layer of dirt, grease, and dead organic matter which coats the body surfaces. If we remove this surface layer we remove with it almost all the surface bacteria. It follows that, in the disinfection of the skin, mechanical cleansing with hot water, soap, and a nail-brush takes by far the foremost place. Afterwards you may use chemical disinfectants, but these are of secondary importance. In order that you may have ocular demonstration of the truth of this proposition, I show you two plate cultivations prepared by my own hands. The first was made by dabbing my fingers all over the surface of the culture medium before washing, and you will see that hundreds of bacterial colonies have grown on incubation. The second plate was prepared in the same way after ten minutes' scrubbing with soap and a nail-brush, after which the hands were rinsed in sterile water and dried on a sterilised towel. No chemical disinfectant was used. You see that two or three colonies have grown: sometimes the plate remains sterile in such an experiment. I have removed 99 per cent. of the surface bacteria from my fingers by mere mechanical cleansing. A nail-brush can only be used on the skin. In the mouth much may be done by gargling, especially with oxidising agents such as permanganate of potash, which, apart from the chemical disinfection it exerts, destroys the dead organic matter in which the bacteria are breeding: the tooth-brush is a valuable mechanical aid in the disinfection of the mouth. Even in the intestine something may be done by purgation and enemata. Mechanical cleansing is further of the greatest value as a preliminary disinfectant measure for all infected vessels, utensils, and instruments. It is an essential preliminary in the preparation of sponges, ligatures, etc., for surgical operations. Its use, in general terms, lies in the fact that it removes the dirt in which bacteria grow, and thus assists the action of whatever further disinfectant measures may be employed.

*Filtration* is a means of mechanically removing bacteria from fluids. Air can be sterilised by passing it through a layer of cotton wool. Water can be sterilised by passing it through a filter with sufficiently fine pores. The common domestic filter has little action in arresting bacteria, and indeed it usually has the reverse effect, for, when it has been some little time in use, it becomes clogged with organic matter, in which the bacteria breed so freely that they are positively added to water passing through. Filters with pores fine enough to restrain the passage of bacteria require artificial pressure to get even water through them fast enough for practical purposes. Of such high-pressure filters the Pasteur Chamberland, made of unglazed porcelain, and the Berkefeld, made of a compressed siliceous earth, are well-known forms. Even these will not continue to deliver a sterile filtrate; after two or three days the bacteria grow through the pores of the filter, and then it requires to be boiled, after which it again becomes efficient for a day or two.

*Desiccation.*—Bacteria differ very widely in their capacity to resist drying; spores can resist it almost indefinitely. Dried tubercle bacilli retain their virulence for many months and the bacilli of glanders and diphtheria for many weeks. The poison of scarlet fever can cling to articles of clothing for months, and that of smallpox for even longer periods; other bacteria are quickly killed by drying. *Staphylococcus pyogenes aureus* is soon killed. Streptococci can endure longer. The typhoid bacillus and *Bacillus coli communis* will not stand drying long, and the pneumococcus and gonococcus perish very quickly; but we rarely use desiccation as a means of disinfection. Its importance lies in this, that only those pathogenic bacteria which can resist drying are capable of being carried far by the air. Only in one respect is drying favourable to bacteria: dried bacilli—such of them, that is, as can resist the process—are far less easily killed by heat and disinfectant gases than in the moist condition.

*Light* is a disinfectant agent of great value. All bacteria grow much better in the dark than in the light. Direct sunlight is fatal to them—quickly fatal in the case of the more tender kinds, slowly fatal in the case of spores; diffuse daylight kills more tardily. Free access of light and sunshine is thus of direct benefit in the sick-room; the converse conditions foster infective disease. It seems likely

that certain specific rays are particularly prejudicial to bacteria, and in the Finsen lamp and the X-ray apparatus we probably have very powerful means for their destruction. Disinfecting chambers have already been designed in which infected material can be flooded with intense light, but our real knowledge is at present too imperfect in these matters to allow of any definite conclusions.

*Heat* is, of all the agents at our command, the simplest and most reliable for complete disinfection. Save in the form of the actual cautery we cannot employ it for the human body, but it is a good general rule that if it is possible to disinfect by heat this method should be preferred. The great majority of objects which it is required to disinfect will readily stand a heat sufficient to destroy all forms of organic life if it be properly applied.

The facts which you require to know concerning the destruction of bacteria by heat are shortly these. The vegetative, non-sporing forms are killed in ten minutes at 70° C.; nearly all are killed at 60° F. The only possible exceptions are the tubercle bacillus and some varieties of the ray fungus, but the most resistent forms of these are killed in half an hour at 75° C. Spores, on the contrary, require the temperature of boiling water for their destruction. At 100° C. anthrax spores are killed in from two to ten minutes, and the more resistent spores, such as those of the hay bacillus, in thirty minutes. This astonishing resistance is unparalleled in the realm of organic life, but can readily be verified by direct experiment; and it is only in the moist condition that spores can be killed so easily as this. Even non-sporing bacteria have been known to withstand 100° C. for an hour in the dried state, while Koch and Wolffhügel found that a temperature of 140° C. for three hours was requisite to kill dry spores.

Such temperatures are attained easily enough, and most objects, even textile fabrics, are not injured much by them. Complete disinfection by heat is in most cases easily carried out. The problem is a purely physical one, namely, to secure the access of adequate heat to every part of the object to be disinfected. The difficulties which arise are connected with the nature of the objects in question, which are often bulky in their mass and very bad conductors of heat. These difficulties are almost entirely overcome by the use of steam, as will presently be explained. There are three ways in which heat is commonly employed in disinfection, viz. dry heat, boiling, and steaming. Each method has its practical uses and limitations, which must shortly be considered.

*Dry heat* is the least useful method for several reasons. It has been already pointed out that bacteria require a much higher temperature for their destruction in the dry condition than when moist. There are certain objects, especially woven fabrics, which are liable to damage at the high temperatures required (*e.g.* 120° C.); and the worst objection of all is that, in the case of objects such as mattresses and pillows, which are bad conductors of heat, it is impossible to attain a sufficiently high temperature in their centres without scorching their outer casings. For these reasons dry heat has been abandoned in the disinfection of bedding and clothing; but it is a most convenient and certain mode of sterilising glass vessels, bottles, and other apparatus in the laboratory. Hot-air sterilisers are used for the purpose, and a temperature of 200° C. to 300° C. is readily attained in them. The method can also be used for metal instruments, but for these boiling is preferable.

*Boiling* is more generally useful than dry heat in surgical disinfection. It spoils certain objects, such as sponges and ligatures, and there are many things obviously unfitted for the process, *e.g.* large objects and things into the composition of which wood enters; but for small objects, and especially surgical instruments constructed entirely of metal, and the candles of high-pressure filters it is excellently adapted. Half an hour's boiling at ordinary atmospheric pressure ensures sterilisation, at least so far as pathogenic organisms are concerned. At high elevations longer exposure would be needed on account of the lower temperature of ebullition. We are not restricted to plain water as a medium in which to boil things. The addition of carbonate of soda is an advantage in sterilising surgical instruments, as such a solution appears to tarnish them less than pure water, while its boiling-point is a little higher. Alcohol has too low a boiling-point to be of much service, but there is a liquid called cumol, a hydrocarbon with a very high boiling-point, which has been successfully used for the sterilisation of catgut ligatures. By boiling under pressure, in special apparatus, even alcohol can be used with success.

*Steam.*—Where there is any difficulty about the penetration of heat into a mass steam is incomparably the best means of applying heat, so that it has superseded all other methods in the disinfection of bedding and clothing. The reason for the superiority of steam is a physical one, viz. its high latent heat. The amount of heat required to convert a given weight of water at 100° C. into steam at 100° C. is more than five times as great as that required to raise the same weight of water from 0° C. to 100° C. Yet the steam is no hotter than the water; all this energy has become latent, and the moment the temperature falls and the steam again condenses, it is at once given out again as effective heat. It is thus the faculty of ready condensation which gives steam its high disinfectant value and immense power of penetration. When it comes in contact with a mattress it condenses in the outermost layer, gives up its great latent heat, and shrinks enormously in volume, thus making way for more steam to repeat the process in the next layer. And so, layer by layer, the whole mattress, to its very centre, is speedily raised to the temperature of the steam, quite irrespective of its low power of heat conduction. I

have repeatedly tested steam disinfection in the Washington Lyon's steam disinfector in use at this hospital by placing hay bacillus spores, which are amongst the most resistent known, in the centre of a *Medical Directory*, and wrapping it up in cloths and blankets. I have always found that they are killed. Any temperature which is desired may be attained by increasing the pressure under which the water boils. At a pressure of two atmospheres it boils (and condenses) at about 120° C., and it is rarely needful to employ a greater pressure than this. The essential point to bear in mind about steam disinfection is that the steam should not be artificially heated above the condensation point natural to it at the pressure under which it has been generated. If this is done it loses its faculty for ready condensation, and is thus bereft of its penetrating virtues: superheated steam is not much better as a disinfectant than hot air. Steam at 120° C. is not necessarily superheated steam if the pressure is one of two atmospheres, for it condenses at 119·9° C. Absolute reliance may be placed in the sterilising powers of any good form of steam disinfecting apparatus properly worked. Nothing can approach it for the disinfection of bedding, clothing, and textile fabrics generally, and for the preparation of dressings, towels, etc., for surgical use. It spoils none of these things, but it fixes the stains of blood, fæces, and urine indelibly, so that articles thus soiled should be previously soaked in water. The virtues of disinfection by heat are thus so great that it should always be employed wherever possible.

It is not a little curious that the most extreme cold attainable has no disinfectant power. Even by the aid of liquid air it seems impossible to kill bacteria; they revive on thawing.

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## LECTURE II.

*Chemical Disinfection.*—I pass now to the destruction of bacteria by chemical poisons. It is upon this that we are compelled to rely when the preceding methods are for any reason inapplicable. But I repeat that you should never use chemical disinfection when heat could be employed, because the latter is much more certain. Further, mechanical cleansing should, where possible, precede chemical disinfection.

It is probable that more nonsense is talked and believed concerning chemical disinfection than about any other practical methods in medicine and surgery. This is partly because the better known disinfectants have become a sort of fetish; they are used as a matter of routine without any consideration as to whether they are being used under conditions in which they can possibly be effective. It is partly because they are called upon to act under very complicated chemical conditions, of which we understand little. And, lastly, it is because of our unavoidable ignorance, for we are only beginning to understand how chemical poisons attack living protoplasm. We may know a great deal about the chemical properties of a given disinfectant, but we know singularly little about the chemistry of the living protoplasm with which we intend it to interact. All we can say is that, by processes of chemical addition or subtraction, we can so upset the molecular balance of the protoplasm that life is no longer possible.

It is possible that the protoplasm of bacteria differs in some respects from that of which the cells of the human body consist. But such differences, if they exist, are probably in detail and not in essential character. For it is generally true that a chemical substance poisonous to one kind of protoplasm acts also as a poison upon another. It yet remains to discover the disinfectant which will kill bacteria without also damaging, if not killing, the living tissue cells with which it comes into equally fair contact. And, indeed, bacterial spores, in virtue of their impermeable capsules, are far more resistent to disinfectant agencies than are the cells of the human body. It is for this reason that aseptic surgery is replacing antiseptic surgery. In our efforts at the superficial disinfection of the body we may cheerfully risk the destruction of a few human tissue cells of only local importance. But it must always be borne in mind that the chemical substances which will truly slay the more resistent bacteria will also kill the human tissues into which they come into equally intimate contact, and that the bacterial poison is also a human poison if employed in a correspondingly large dose. The incautious use of powerful disinfectants has been known to kill the patient.

Short of actually killing the bacteria, chemical poisons may interfere in varying degree with their vital activity. Three grades of poisonous activity are recognised in this connection.

(*a*) *Attenuation of virulence.*—This is the slightest degree of chemical interference. The poison may be so mild in its action that it does not actually check the growth and multiplication of the bacteria, but yet impairs their higher functions. The power of forming spores may thus be abolished in anthrax bacilli in presence of small amounts of carbolic acid. Similarly the power of forming injurious toxins may be impaired, so that a pathogenic organism becomes less virulent. This is why this mild degree of interference with bacterial activity is called "attenuation." A similar result can be attained by other than chemical agencies, *e. g.* by causing the bacteria to grow at too high a temperature for their comfort.

(*b*) *Inhibitory or restraining influence.*—A more potent chemical effect is manifested by the complete cessation of bacterial growth and activity without actual death of the organisms. Removed from the action of the poison, they can again become active and multiply. The term *antiseptic* should properly be restricted to this inhibitory degree of

action, as it means the antagonising of "septic" or putrefactive change, and does not necessarily imply the death of micro-organisms.

(*c*) *Germicidal or disinfectant action.*—This is the most intense degree of chemical action upon bacteria, and means their actual death.

Chemical poisons of different intensity may act to these three different degrees, or a single poison may act in the three degrees according to its dilution and the duration of the exposure. As a familiar example, carbolic acid will merely attenuate the virulence of anthrax bacilli if it be added to the medium in which they are growing in the proportion of 1 part in 1000. In greater strength, 1 part in 400 or 500, it prevents their growth, but does not kill, at least for a day or two. But in a strength of 1 part in 40, carbolic acid will kill non-sporing anthrax bacilli in a few minutes, though it cannot kill their spores. To destroy these, even a 1 in 20 solution of carbolic acid takes many days, or even a week or two, and there are some very resistent spores, such as those of the hay bacillus, which resist this solution for two months or more. I show you here a culture of anthrax spores which have survived immersion in 1 in 20 carbolic acid for twenty-three days, and one of hay bacillus spores which have survived seventy-one days. Similar facts are true of other disinfectants.

At the outset, therefore, this principle must be enforced, that a chemical poison, to act as a disinfectant, must be present in a certain effective strength of solution, and must act for a certain time. The most valuable disinfectants may be worthless unless this principle is borne in mind. People are too often satisfied with knowing that they are using approved disinfectants, such as perchloride of mercury or carbolic acid, without stopping to reflect whether they are using them under conditions in which they can act effectively. To pour a little 1 in 1000 mercuric chloride solution over a typhoid stool, and to sprinkle pink carbolic powder down a drain, are common acts of foolishness begotten of ignorance or want of thought.

The value of a chemical disinfectant must, in the first place, be tested by accurate laboratory experiment, and this is often a laborious and difficult task, beset by many fallacies. As an example of the sort of information required, and the way in which it is ascertained, let us take the case of mercuric chloride, supposing ourselves to be in complete ignorance of its germicidal powers.

It would first be necessary to determine its killing power upon bacteria in pure watery solution with no disturbing chemical factor present. Such solutions, of various strengths, would have to be tested upon different kinds of spores, and upon different forms of non-sporing bacteria. The vitality of the test organisms, after different times of exposure, would have to be tested by subcultures upon nutrient media. After a number of such experiments we should at last arrive at the conclusion that, in pure watery solution, most non-sporing bacteria were certainly killed, almost instantaneously, or at the most in a minute or two, by 1 part of the mercuric chloride in 1000. We should, however, find a notable exception to this rule in *Staphylococcus pyogenes aureus*, which may survive in such a solution for twenty minutes, or even half an hour or more. In our results on spores we should be led to suppose that these too were killed in a few minutes, for they would not germinate when transplanted to a suitable culture medium, even though carefully washed to free them from all apparent traces of the disinfectant. Yet here we should be quite wrong, and this is a good example of the fallacies which may beset this path of research. For it appears that traces of the mercuric chloride, quite sufficient to restrain their growth, adhere so closely to the spores that they cannot be got rid of by mere washing in water. It requires chemical agents which will precipitate mercuric salts in an insoluble and inert form to get rid of such traces. In Koch's original researches upon mercuric chloride he stated that anthrax spores were killed by a strength of 1 part in 1000 of water in a minute or two. But some years later Geppert proved that, if the spores were washed in ammonium sulphide after treatment with the mercuric solution, very different results were attained. If we use this method we shall find that a 1 in 1000 solution of mercuric chloride takes three or four hours to kill anthrax spores instead of three or four minutes. And if we test the same solution upon hay bacillus spores, which are much more resistent than those of anthrax, we shall find that it takes two or three days to kill them.

By the above experiments we shall have gained a fair idea of the disinfectant power of mercuric chloride when acting in pure watery solution. But this is only the starting-point of the research. We have next to see whether it will act equally powerfully under the conditions in which a disinfectant is actually required in practice. We want to disinfect pus, blood, fæces, sputum, and all the various secretions and discharges from an infectious case. These are complex chemical substances, and it may well be that some of these substances interfere with the germicidal action of the perchloride. For example, such secretions usually contain albuminous material in large amount and other chlorides, such as those of potash and soda. We must therefore devise laboratory experiments which shall reproduce as closely as possible the conditions of actual practice, mixing the disinfectant with actual pus, fæces, and sputum, and testing by cultivations the degree of germicidal power it displays. Here a certain amount of disappointment awaits us. Mercuric salts form, with albumen and other proteids, compounds which are relatively insoluble, inert, and devoid of disinfectant action. Our experiments will prove that the more albuminous material there is present, the less active will be the disinfectant action of the mercuric salt, so that larger relative amounts will be needed

to accomplish the same result. In other words, the *effective* germicidal strength of solutions of mercuric salts in presence of albumen is much diminished, simply because much of the poison is rendered inert or nearly inert. Van Ermenghem states that while cholera vibrios are killed in nutrient broth by a strength of 1 part of mercuric chloride in 60,000 in half an hour, it requires a strength of 1 part in 800 to kill them in the same time in blood-serum. It follows that the action of mercuric salts in watery solutions is a poor guide to what it can accomplish under the conditions of actual practice.

If, again, we test the influence of other chlorides such as those of potassium or sodium upon the disinfectant action of mercuric chloride, we shall find that they diminish it, though for a different reason, which will presently be explained. The addition of increasing quantities of common salt to a mercuric chloride solution steadily lowers its germicidal powers.

It will also be of importance to determine whether the mercuric chloride, which has been found so efficacious in watery solution, possesses an equally powerful germicidal action when dissolved in other fluids,—as, for example, in alcohol. In testing this it will first be needful to determine the killing power of the solvent itself, and it will be found that strong spirit kills non-sporing bacteria in a very few minutes—almost as quickly, in fact, as a 1 in 1000 watery solution of mercuric chloride. Spores, however, are not killed even by absolute alcohol in many days. Clearly, then, we are limited to spores as our test objects, and if we expose them to watery and to alcoholic solutions of mercuric chloride of equal strengths, say 1 in 1000, the test will be a fair one. We shall find that whereas the very resistant spores of the hay bacillus are killed in one or two days by the watery solution, they are unaffected even by a fortnight's immersion in the spirit solution. If we had taken non-sporing bacteria as our test objects this difference would not have been apparent. But we should fairly be entitled to conclude that the destruction of non-sporing organisms by spirit solutions of mercuric chloride was due rather to the spirit than to the mercuric salt. I show you here a cultivation from hay bacillus spores which have soaked for two days in a watery solution of perchloride of mercury (1 in 1000). It is quite sterile: the spores have been killed. Here, on the contrary, is a similar culture from spores exposed for a fortnight to a 1 in 1000 solution of mercuric iodide in spirit. It has grown vigorously.

The preceding imperfect sketch of the means by which the value and the limitations of a single salt, such as mercuric chloride as a disinfectant, may be ascertained in the laboratory, will give a general idea of the difficulties and fallacies which underlie this kind of work. Similar experiments would further be required to determine the restraining power of the poison upon bacterial growth. But enough has been said to indicate that mercuric chloride is not a disinfectant in virtue of any essential magic in its nature. If it is to kill bacteria it must be present in a certain definite effective strength in the total mass of the material to be disinfected, it must act for a certain definite time, and it must not be hampered in its action by the presence of neutralising chemical bodies or unsuitable solvents. If these conditions are not fulfilled it may be worthless.

*The ionic theory.*—Within the last few years it has become possible to offer some sort of explanation of some of the above facts. The explanation lies in the apparent paradox that mercuric chloride is not a disinfectant at all. Two atoms of chlorine united to one of mercury form a satisfied chemical compound which cannot readily, of its own initiative, attack bacterial protoplasm or anything else. But it is now proved that when it passes into solution in water, mercuric chloride is in part resolved into something which is no longer mercuric chloride. Like all other electrolytes, it undergoes what is called "ionisation." An electrolyte is, by definition, a substance whose watery solution conducts electricity, and incidentally is decomposed by electric currents. Most chemical disinfectants are electrolytes in their essential nature, and act in virtue of their ionisation. When mercuric chloride is dissolved in water a certain proportion of its molecules—the exact number depending upon the degree of dilution and the temperature—become dissociated into free mercury "ions" bearing a positive electric charge, and free chlorine "ions" bearing a negative electric charge. The germicidal activity of the solution depends essentially upon the number of free mercury ions present. We know that it cannot be due to the chlorine ions, because solutions of sodium or potassium chloride in which ionisation is far more complete than with mercuric chloride have no disinfectant action. It is the active mercury ion, with its unsatisfied combining affinities, which attacks and poisons the bacterial protoplasm. It follows that mercuric chloride is active as a disinfectant in proportion as it undergoes ionisation. In water it ionises fairly well, but in alcohol almost no ionisation at all takes place; hence the feebleness of its alcoholic solution as a germicide. Again, in a given strength of watery solution at a given temperature, the proportion of molecules which remain undissociated to those dissociated into ions is constant—*i. e.* the number of chlorine ions bears a fixed proportion to the number of undissociated mercuric chloride molecules. If now we add to the solution solid sodium chloride, which undergoes very free ionisation, the number of chlorine ions is vastly increased, and many of them unite again with the mercury ions to form mercuric chloride, lowering the disinfectant value of the solution. The very careful experiments of Krönig and Paul have placed these facts about mercuric chloride upon a definite mathematical basis. A few carefully conducted experiments

will convince any one of their truth. I have found that mercuric chloride takes longer to kill *Staphylococcus pyogenes aureus* when suspended in physiological salt solution than when suspended in pure distilled water, and I have had no difficulty in convincing myself of the inability of alcoholic solutions of mercuric salts to destroy spores.

The considerations already discussed will indicate the more important points which must be taken into consideration in determining the value of a disinfectant, but they are not all. In actual practice a number of subsidiary points must be taken into account. It is a disadvantage that mercuric chloride is so powerful a poison to man. Apart from the danger of accidental poisoning it has before now happened that serious symptoms have arisen from its use as a germicide, *e.g.* after washing out the uterus with its solutions. The surgeon whose hands are too constantly immersed in it knows to his cost the unpleasant effects which it produces on the human skin. The chapping and roughening to which it may lead are a serious bar to adequate skin sterilisation upon a subsequent occasion. Like all soluble mercuric salts, it produces a precipitate of metallic mercury in contact with metals. This not only unfits it for the disinfection of surgical instruments, but also for the disinfection of anything contained in metal vessels, for in proportion as the mercury is precipitated the germicidal value of the solution vanishes. Finally, the consideration of cost must not be omitted. Speaking generally, that disinfectant is the best which will enable us to destroy the largest number of bacteria for a halfpenny. The salts of gold and silver, which have a high germicidal value, are unsuited for general use because they are too expensive. Mercuric salts have the advantage of relative cheapness combined with high germicidal value. A salt which will kill in a dilution of 1 part in 1000 can afford to be much dearer than one which is active only in concentrated solution.

The value of a disinfectant is thus dependent not merely on its killing powers as tested in distilled water in the laboratory, but also upon its killing powers in those media which habitually require disinfection, upon its general chemical and physical properties, upon its freedom from danger of poisoning the patient or the medical man, and upon its cost relative to its germicidal value.

## On the Difficulties in the Diagnosis of Meningitis.

By H. S. ELWORTHY.

DR. THURSFIELD'S paper on meningitis in your March number of the JOURNAL gives a fair idea of the difficulties in diagnosing it. These difficulties are perhaps aggravated when the illness continues for a long time, and the patient refuses to die and have a post-mortem, or to give any definite and certain signs of what kind of meningitis he is suffering from, or whether, after all, they are signs of something else.

The following two cases will serve to show how one may come to doubt one's diagnosis after it has been made.

CASE 1.—Boy æt. 5. Seven months previously he came with an enlarged gland—about the size of a small walnut—in the left supra-clavicular fossa. Other small ones about the size of peas found in axillæ and groins. Temp. 98°. They did not improve under treatment, and he was sent to Margate, where the glands disappeared in about a fortnight, I was told, and then he returned home apparently well. I did not see him again for some time.

It may here be remarked that Mr. W. K. Treves, of Margate, in his paper on "The Surgical Aspect of Tuberculosis," read before the Hunterian Society a week or two ago, laid great stress on the necessity of rest and treatment for a *long time* in such cases, and that in order to cure them they must remain under treatment for at least three months. If a number of glands are enlarged I believe he insists on eighteen months at least.

I come now to the meningitis. The boy was quite well up to January 18th, 1902, when he vomited after eating some sweets. On the 25th the chandelier fell down and hit him on the forehead, but did not hurt much, and no mark was found. On the 27th he began to complain of pain in his head, and when I saw him on the 28th at 1.45 a.m. he was restless and moaning, with a retracted abdomen. Pulse 120, very small and soft; resp. 40, and temp. 105°. No physical signs were made out except a rather full bladder, from which ʒiv urine were drawn off. There was no albumen. At 8.30 a.m. the pulse was 140 and temp. 100·8°, and he continually put his hand below the left ear. No knee-jerks elicited and no clonus. At midday the temperature was 105° again, but after this it did not rise above 103°. At 10 p.m. it was 100·6°, and he passed urine and fæces unconsciously. At this time I felt perfectly satisfied that it was a case of tuberculous meningitis, notwithstanding the fact that on two occasions the temperature was 105°. On January 30th twitchings were noticed, but he had stopped vomiting, and took food well. In the evening the left eyelids were œdematous, looking like a bladder, and the right pupil very sluggish. Semi-conscious; temp. 102·2°. He moaned at times and continued to take fluid nourishment. The temperature kept below 102°.

On February 5th the right eye deviated to the right slightly, and on the 6th both discs appeared normal, and no deviation noticed. On the 8th the right ear appeared to be giving trouble. The membrana tympani was incised, and two or three drops of clear serum escaped, but no pus. Kernig's sign present on 9th, but no knee-jerks. Respiration somewhat of Cheyne-Stokes character—moist râles in chest. 12th.—Clear serum still discharging from right ear.

17th.—Collapsed, but revived again. 18th.—Left disc slightly blurred, vessels clear beyond. Could not get a view of right one. Ear discharging slightly; cleared up after this. 19th.—There was internal squint of right eye. 20th.—Both discs appeared normal.

A month had now elapsed since his illness began, and for some time it seemed to me more and more doubtful whether the diagnosis was correct or not.

When in this state of mind I often make a record of what my actual impression is, in the hope that at some future time it may be useful. At any rate I believe it tends to correct any overweening self-conceit, and makes one take a more charitable view of other people's mistakes.

The note in this case is—"I have come to the conclusion that this is a simple meningitis and not tuberculous, because there has never been any hydrocephalic cry, never any coma, no convulsions, not the emaciation expected in tuberculous meningitis; the general regularity of the pulse, only irregular on a few occasions, and also the same with regard to breathing."

Of course this reasoning is somewhat defective. A man at the bedside has to make use of the knowledge or ideas that are in his mind at that particular time. That is his clinical value as a practitioner; and if he cannot remember everything about any kind of disease he is treating at the moment, that loss of memory, or failure to correctly balance up the probabilities, is the measure of his distance from perfection.

On the 23rd, after feeding, the mouth was drawn over to the right, but soon recovered its position. 24th.—Morning: Cheyne-Stokes breathing very marked. Evening: pulse 136; resp. 24; temp. 100°. Right disc appeared normal. Knee-jerks absent. Cremasteric reflex active. Pulse and breathing irregular. Both eyes look straight; pupils equal and react sluggishly. About one hour after he died suddenly.

During his illness the head was retracted on several days, but not persistently for any length of time. Certified him as tuberculous meningitis. There was no P.M.

CASE 2.—Girl æt. 14 months, breast-fed up to now. Seen February 13th, 1903. She had had whooping-cough at Christmas, and the cough had persisted, but not the whooping.

On February 8th she was noticed to be very drowsy, and again on the 9th, sleeping nearly all day and night, and on the 11th crying all day and very weak. She vomited every time after food; had no fits. Bowels regular. On 13th had been sick all day, and twitching about the eyes began last night and has continued all day. Twice during the day she threw out her arms and became stiff. Pulse 168; resp. 34; temp. 103·6°. Toes extended on tickling sole. No knee-jerks elicited. Pupils react very little to light. Tongue a little furred. Nothing found in chest, abdomen, or throat. No phthisis in family. Cries out in a whining manner. 14th.—Been very restless all night; eyebrows and face twitching. Vomited after first dose of bromide, not since. Throws out hands and legs and cries out now and then (I did not see this). Pulse 168; resp. 60; temp. 102·4°. Puckers up eyebrows; no squint. Here there is a note—"I suspect tuberculous meningitis." 15th.—Knee-jerks both present. Tongue very furred. Moves about eyes when asleep; right eye opens wider than left. Hyd. c̄ Cret. gr. ij om. mane. 16th.—Very costive and restless. Not so much twitching of eyebrows. Cries out and whines as if in pain. 17th.—Tongue clean at tip and sides; cries out more, but seems stronger. Temp. 102·4°. 18th.—Seems quieter; vomited once. Pulse 148; resp. 60; temp. 102°. Tenderness over first molar in lower jaw, which is coming through; incised gum over it. 20th.—Slept a good deal. Opens mouth and gapes; puts hand into it. Temp. 99·8°. Knee-jerks active. 23rd.—Pulse 128; resp. 44; temp. 100°. Vomited several times yesterday; takes no interest in surroundings. No twitching. Moaning yesterday. Has flatulence and then vomits. Put on a particular brand of condensed milk for a fortnight. 26th.—Only vomited once since 23rd. Does not cry out much now. Very constipated. Temp. 98°.

March 1st.—Very fretful. Throws head back and becomes rigid when asleep. 4th.—Looks much brighter. Still draws back head, throws out arms, becomes stiff, and cries out several times a day. Flushes at night. Eats well. No vomit. Note again: "I take it to have been a slight attack of simple meningitis or some peripheral irritation, such as teething or abdominal trouble—uncertain which." 9th.—Not so well; lay still and dormant all day yesterday, not eating well, but no sickness. No attempt to walk. Twitching of eyebrows several times yesterday. 16th.—Screaming and throwing out arms and becoming stiff nearly all last night, the worst night she has had. Bowels constipated; eats very little. Teeth coming through; lanced gums freely. 23rd.—Better. Takes notice of things now. Still throws herself out stiffly and puts her hands to her head. Put on emulsion of hypophosphites.

April 8th.—Much better. No twitching of eyebrows; no vomiting; puts hands up to head now and then. Sleeps badly.

May 1st.—Very fidgety, cries nearly all day. Sleeps very little in day. Bad-tempered; bowels regular; motions good colour. The two teeth have come through. Does not look at all ill.

The head was retracted on several occasions. Kernig's sign could not be elicited owing to the irritability of the child. There was never any paralysis, but she would make no attempt to move unless handled, and then resisted all she could. The vomiting was troublesome at first, and there was nothing pointing to ear trouble. She seemed to be annoyed by light, and wanted to be left alone. This

case now appears to me to have been due to dentition, but I cannot be certain that there was not some slight amount of simple meningitis, or possibly tuberculosis.

Some wise person has said that "first impressions are generally right," but in this case my first impression—that cerebral irritation following whooping-cough was most likely to be tuberculous meningitis—does not appear to be right at all; but how can we be certain that it is never recovered from?

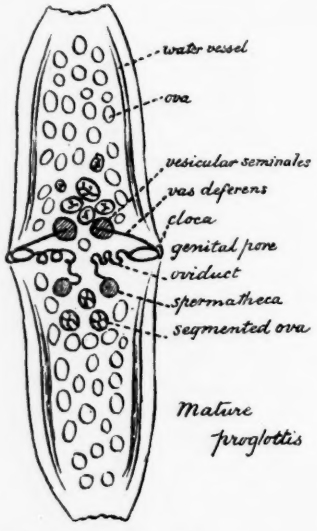
As a rule I am very sceptical about disorders caused by teething; one hears so much of them, and finds so little evidence that they are so. However, there is no doubt that there are cases here and there which are directly connected with that process.

I offer no theories or guides to diagnosis beyond simply advocating the ordinary Bart.'s teaching in general practice: examine the patients, think about what you observe, and don't be too cock-sure of your diagnosis.

## A Case of Tænia canina or cucumerina.

By E. C. PRINGLE, M.B.

ON May 12th a mother brought her child, æt. 5 months, to the surgery, complaining that the child was wasting; she at the same time produced a bottle of water containing some white seed-like bodies. These bodies she said the child had passed in its motions. They were white in colour, elliptical in shape,




something like melon-seeds (whence the name *Tænia cucumerina*), varying in length from one fourth to one third of an inch, notched at either end, and apparently to the naked eye divided mesially into two. Under the microscope, each of these bodies was seen to be a mature segment of a tapeworm, the *T. canina* or *cucumerina*, or, as Cobbold prefers to call it, *T. elliptica*. The apparent division was due to the bilateral mesially placed genital pores, into each of which enters a complete set (male and female) of reproductive organs. The oviduct has a convoluted appearance. The vas deferens is straighter and shorter than the oviduct. The ova, in different stages of development, were scattered throughout the segments examined. The *T. canina* is a common tapeworm of dogs, and occurs in considerable numbers, living in the small intestine. Its length varies from four to twelve inches. It has a chain-like appearance, and contains about one hundred segments, of which the last twenty-five are mature. The head has four suckers and a rostellum, which has about sixty hooklets arranged in four rows. The intermediate host is the dog louse, or *Trichodectes canis*. The dog, irritated by these parasites, licks the part, and so transfers the parasites with the contained cysticerci to its alimentary canal. The parasite is rare in man, and nearly all the cases reported have been in children. This fact is accounted for by the mode of infection, which is probably undue familiarity with dogs, either fondling or receiving their kisses.

## On Examinations.

By A SUFFERER.

HE who aspires, in these latter days, to the privilege of writing certain letters after his name, and to exemption from service on juries, must realise early in his career that these honours can only be achieved after many and frequently humiliating encounters with the powers that be. Medical men of the present generation will agree that some of the most vivid moments of their memory are connected with these dread trials of strength conducted in the place that has received the poetical, if misleading title of "The Hall by the Sea." We believe it was Edward Carpenter—the author of a book bearing the audacious title "Civilisation, its Cause and Cure"—who defined an examination as "an unpleasant process by means of which the candidate is made to vomit what has been crammed unwillingly into him."

Without aspiring to the picturesque vigour of such language, it must be owned that an examination is an exceedingly unpleasant experience, and that the acme of discomfort is reached in the last half-hour before a *vivâ voce*. It is then that a man's past rises before him as it is supposed to do before the drowning man, and he remembers with agonised intensity the hours of idling that might have been so differently spent, and catches desperately at the various straws of knowledge—ill learnt and half recollected—that pass through his fevered brain. Or else the resignation of despair has settled upon him, he feels that it is too

late now to try to remember such and such a "tip," and he listens without interest to the spasmodic conversation that surrounds him, dealing as it does chiefly with speculations about the questions that are sure to be asked, or with vague rumours of the specimens and cases that have been sent from the various hospitals. He hears the numbers being called out gradually creeping up to his own, and he feels that his fate will soon be settled one way or the other, and that these are trifles of as little import as the gossip of his neighbours to the dying man. Mulvaney says that war is like falling in love—it takes each man differently. So it is with examinations; the nervousness and anxiety that all feel affect each as differently as the call to the guillotine affected the aristocrats in Sir Henry Irving's representation of Robespierre. One makes no attempt to conceal his great discomfort—it is written in every line of his pale face and drawn mouth, in every tremor of his shaking hands. Another makes a braver show, and, by telling wholly untrue reports of previous encounters in which he has always succeeded in scoring heavily off his examiners, contrives to give an impression of nonchalance and ease that is very far from the truth. Equally various are the conditions of mind of the candidates when they come to close quarters with the enemy. The mere act of sitting down opposite the two examiners deprives some of the ordinary powers of speech, and they show to perfection the symptoms of that very real clinical entity—examination aphasia. To another the sight of the small table with the specimens upon it acts as a stimulant; he finds himself suddenly possessed of an astonishing clearness of brain, facts leap to his tongue from what we are taught to call the subliminal consciousness, and the most intricate problem becomes at a word absurdly simple. To a third a very curious psychological phenomenon occurs. He is asked a question the correct answer of which he knows, yet he hears himself saying something quite different, and, as the words pass his lips, he is aware of their absurdity, yet can do nothing to correct or alter them. We remember on such an occasion being asked what we should do if we were called to a woman who was bleeding from a placenta prævia, and telling the examiner that we should leave her and await events. We were no more able to make any other answer than to run from the nameless horror that pursues us in the conventional nightmare. The examiner in question was possessed of a very expressive face, and to this day the expression that face assumed rises before us when we experience what the text-books call a night terror, and we are still unable to make any other than our ridiculous answer. It is as though such a candidate were possessed by some demon who deliberately distorts his speech and fuddles his brain, whilst he can only remain an agonised spectator.

But even *vivâ voce* examinations at length come to an end, and we are submitted to the crowning torture of waiting for the result. During that period our sufferings are magnified tenfold, and we feel that even the presentation of a pink paper would be better than this horrid suspense. Yet some fortunate ones pass the smiling custodian of the door without that presentation, only to prove—after the first intoxicating moments of relief and triumph—the profundity of the truth of George Meredith's saying that "nothing is so disappointing as achievement."

## Notes.

We publish in another column a letter from the three gentlemen who were appointed at the general meeting of students, held earlier in the year, to inquire into the best method of starting and organising a Students' Union. The task which those three gentlemen undertook proved to be no light one, involving as it did careful investigation of the methods of the various organisations of the same kind existing at the other hospitals throughout the country, and we feel confident that, when they present the report of their labours to the general meeting which it is proposed to call, all will agree that the trust reposed in them has been fully justified, and that they have completed their labours with a zeal and care which cannot be too highly praised.

* * *

It is obvious that the actual details of the organisation cannot be decided on without further careful consideration and discussion. The fact to be impressed on men now is the great desirability of making this Students' Union a really vital association of all Bart.'s men, to embody and foster the *esprit de corps* that exists amongst us, and to give voice to the needs of the students as they may arise in the development of the Hospital and School. In this, as in all other matters, union is strength. Without such union the sporadic demand for necessary reforms which may from time to time arise is doomed to failure.

* * *

It would be interesting, if time and space allowed, to trace the evolution of the medical student from the days when he was a mere appendage of doubtful reputation and more than doubtful morals, regarded chiefly as a means of enriching the various members of the staffs of the hospitals by the payment of large fees, to the hardworked and diligent individual, as we know him, who has become an integral and necessary part of the work of the hospitals, on whose good conduct the reputation of his particular school largely depends. At any rate, it will be readily conceded that the time has come when all the various interests and cliques should be amalgamated into one corporate body, the only qualification of whose membership shall be the

honoured title of a "Bart.'s man." It is just this demand that the Students' Union proposes to fulfil; and all who have the true interests of the Hospital at heart will join in wishing every success to the venture, and will spare no pains in setting the whole matter on a sound and permanent basis.

* * *

ONE of the many points at present under discussion concerning the new buildings is the continuation or not of residential quarters for students.

* * *

WE feel strongly that the existence of a resident college is of the very greatest benefit to those who live in it, and through them to the whole body of students; and we are convinced that the College, as it has existed with us since the early days of Sir James Paget, has done very much for the reputation of the Hospital and School. It is reasonable to argue that if the row of unattractive houses which has long been dignified by the name of college—a word that calls up pictures of stately buildings and quiet expanses of cool green lawn—has been of such use to us, a more adequate building, with proper and comfortable accommodation for the student of the present day, would do much to conduce to the health and well-being of men just joining the Hospital. The College, as we know it, has done its work, and has done it admirably well, but it is hopelessly out of date, and has long been surpassed by the institutions of other hospitals. It was founded in the days when medical students were only just emerging from the Bob Sawyer and Ben Allen stage of their existence, and when any civilising influence was regarded as a rash experiment. Now things are very different, and we feel confident that if we are to maintain our position in the forefront of the English hospitals we must recognise and cater for the increased demands of the latter-day student. St. Bartholomew's was the first hospital in England to provide resident quarters for its men, and now that others have followed our admirable example we must see to it that we are not outdone by our disciples. It is because we feel so strongly on this point that we are waiting with anxiety for the decision of the Committee on the question of the new buildings, and we welcome the foundation of a Students' Union as likely to strengthen the hands of those who are trying to keep this great Hospital up to the standard which it has always upheld.

* * *

SIR DYCE DUCKWORTH has been appointed the Representative of the Royal College of Physicians on the Court of the University of Liverpool, and is to deliver the address at the opening of the Winter Session of the Medical Faculty in October next.

* * *

MR. JESSOP has returned from the recent Congress held at Madrid. As Honorary President he took the chair for one day in the ophthalmological section, and delivered Landolt's report on Acuity of Vision, and led the discussion that followed the paper. He also read a paper on "The Prognosis in Cases of Glioma Retinæ."

* * *

THE Brackenbury Surgical Scholarship has been awarded to Mr. T. J. Faulder.

* * *

THE annual Past *v.* Present cricket and lawn tennis matches will be played on Wednesday, June 3rd, at Winchmore Hill. This is always a very pleasant opportunity of meeting men who have gone away from the Hospital, and, given fine weather, there is every prospect of a successful day.

* * *

THE results of the Fellowship examinations are very satisfactory. In the Primary examination of the fourteen Bart.'s candidates nine were successful. In the final, of the thirteen candidates eight passed. In a year when the number of successes were not half the whole, these results are highly gratifying, and bear testimony alike to the excellence of the teaching provided, and to the diligence of the examiners. We offer the several gentlemen our warmest congratulations.

* * *

THE scene was Casualty Ward. During the discussion of the case the great name of Matthews Duncan was mentioned, whereupon the intelligent student said, "He is the man who makes the chloroform, isn't he?" Truly a prophet is not without honour, save in his own country.

* * *

THIS is a charming quotation from the columns of a paper called the *Christian:*—"Outside some of the chief Parisian railway stations there are now being displayed certain physiological charts, setting forth in a vivid manner, by means of natural colours, the state of the bodily organs in health, and as affected by alcohol. Such representations strike people far more forcibly than mere verbal descriptions. It is an admirable idea. We should like to see charts similar to these employed in all our day schools, so that even children might understand, at their most impressionable age, how the body is ravaged by the use of alcohol. In view of the terrible effects of strong drink upon the population, it would be a wise piece of legislation to make definite teaching upon this subject compulsory in all schools. Children would then see how drink defiles and ruins the handiwork of God." We wonder what sort of impression the contemplation of a vivid representation of a cirrhotic liver, or an atheromatous aorta, would make on the mind of a Board School scholar. Or should we see paintings of blue-tailed rats, and the various forms of serpents that harass the restless hours of the sufferers from delirium tremens?

* * *

It may interest some Bart.'s men to know that it has been decided to inaugurate this year 2nd XI inter-hospital cup ties. This is the first year that we have attempted such a thing, and it is hoped that it will lend an impetus to cricket, outside the 1st XI, which has not been too conspicuous of late years. It therefore behoves all Bart.'s men who are in their year, and who play the game, to come forward and help the Hospital, as there is no reason why Bart.'s should not walk off with the cup this year, and be the first hospital to have its name inscribed thereon, if fellows will only lend their full support. So far there is considerable promise, as the 2nd XI have managed to win the only two matches it has played this season. The first was against St. Thomas's 2nd at Chiswick on May 13th, when we won by five wickets; the second was against West Green 2nd on Saturday, the 16th, at Winchmore Hill, when we were again victorious by six wickets, both of which are very creditable performances. Any men wishing to play will much oblige by communicating with Mr. A. J. Kendrew, who has been appointed Hon. Sec. to the 2nd XI.

* * *

It is proposed to hold a Vacation Class in Practical Clinical Pathology during the present summer. The course will comprise—

(1) Elementary Bacteriology, including the chief pathogenic microbes and their clinical diagnosis.

(2) The Examination of the Blood with the methods of blood staining.

(3) The Chemistry of the Urine and the investigation of urinary sediments.

(4) The examination of Pus, Stomach Contents, Sputa, Ringworm, etc.

The class will be in the charge of the Medical and Surgical Demonstrators of Pathology, and will be held four times a week for a month, commencing about the middle of August. The fee will be five guineas. The class will only be held if at least six gentlemen signify to the Demonstrators their intention of joining.

## Review.

Manual of Surgical Treatment. By Cheyne and Burghard. (Part VI, Section ii.—Affections of the Rectum, Liver, Pancreas and Spleen, the Genito-Urinary Organs, the Breast, and the Thorax.) (Longmans, Green, and Co. Price 21s.)

This volume is the last of an excellent treatise on surgical treatment, and the authors are to be congratulated on the completion of their work.

All surgical affections, rare or otherwise, are treated in the same masterly manner, and this volume is especially welcome for excellent articles on the diseases peculiar to the liver and biliary apparatus and to the genito-urinary system, each of which is prefaced by a clear and concise account of the anatomical relations, surface markings, etc.

We must, however, confess to some degree of disappointment at the limited space devoted to the surgical treatment of enlargement of the prostate.

We are also not in complete agreement with some of the recommendations in the treatment of certain diseases of the rectum. It is stated, for instance, that a division of the more "superficial" fibres of the external sphincter will suffice to bring about a cure in cases of anal fissure. From a large experience of such cases, we affirm that such treatment will generally result in a second and more complete division. The writers also object to the ligature of hæmorrhoids on the ground that septic thrombosis and secondary hæmorrhage are liable to follow. With this statement we do not agree, and we regard the ligature method as generally preferable to all others.

The article on carcinoma of the rectum is, however, thoroughly good.

The work, as now completed, supplies an obvious want, and it will probably be recognised as the standard work on surgical treatment.

## Correspondence.

*To the Editor of the St. Bartholomew's Hospital Journal.*

### THE PROPOSED STUDENTS' UNION.

Dear Sir,—The Enquiry Committee, elected at the general meeting of students on February 25th, begs to call attention to the following report of its work. In accordance with our instructions concerning matters of urgency, we have submitted to the Medical School Committee a scheme of suggestions *re* accommodation for students, as the plans for rebuilding are now under consideration.

With regard to our more important business, namely, inquiries *re* the advisability of forming a Students' Union, and the best method of organising such, we have collected much information from the principal metropolitan medical schools, and from other sources. We have no doubt about the necessity of forming a Students' Union, and we propose to call another general meeting of students on Monday, June 8th, for the purpose of reading our report and inviting discussion upon the subject.

The following schemes for the constitution of a Students' Union have been considered:

A. (1) That there shall be a representative Council of students of the Hospital and of the Hospital societies and clubs, with the addition of a treasurer who shall be a member of the visiting or teaching staff of the Hospital.

(2) That the functions of the Council shall be—

(*a*) To represent students in matters affecting their welfare, and to exercise control in matters of internal administration.

(β) To be the recognised means of communication between the students and the authorities of the Medical School and Hospital.

(γ) To promote *esprit de corps* throughout the Hospital, and to be the means of bringing the various communities into greater harmony.

(δ) To absorb and expand the duties of the Executive Committee of the Amalgamated Clubs.

NOTE.—It is suggested that a provision be made that the Finance Committee of the Union shall have the same constitution—at least temporarily—as the present Finance Committee of the Amalgamated Clubs.

B. (1) That the Students' Union be a club, supplementary to the existing organisations, and that it either be amalgamated with the present clubs, and be in that case financed by the present Finance Committee, or shall remain as a separate club supported by a separate subscription.

(2) That the functions of the Club shall be as above (α, β, γ).

Out of many schemes of representation for the above Council or Club, we beg to submit the following:

A. For the Representative Council—

I. The electorate shall be divided into 5 constituencies, thus:

(a) Conjoint Board students, 5 representatives, of whom not less than 2 should be in wards and 1 in "rooms."

(b) London M.B. students, 3 representatives, of whom 1 should be in wards and 1 in rooms.

(c) Graduates of Oxford, Cambridge, and other universities, 3 representatives.

(d) Committees of various clubs and societies to elect of their number, 3 representatives.

(e) Resident Staff, 1 representative.

In addition, a member of the visiting or teaching staff to be elected as Treasurer annually at a general meeting of students.

NOTE.—The number of representatives is subject to amendment.

II. The electorate shall be divided into 4 constituencies:

(1) Students engaged in clinical work—

5 representatives, of whom
- 1 must be a Conjoint Board student.
- 1 must be a London M.B. student.
- 1 must be a graduate of Oxford, Cambridge, or other university.

These representatives to be proposed and seconded by members of the group which they represent.

(2) Students engaged in the dissecting rooms, etc., 2 representatives, of whom 1 must be a Conjoint Board student and 1 must be a London M.B. student.

(3) and (4) as above (*d*) and (*e*).

Treasurer as above.

III. All systems of elections by years have been considered unrepresentative and quite impracticable.

B. For Students' Club—

Two constituencies as above, II (1) and (2), and in addition the following *ex officio* members:—(1) a President of Abernethian Society; (2) a Secretary of Amalgamated Clubs.

In conclusion, we suggest that a commission of students be elected at the general meeting, students with power to decide which scheme shall be adopted, to form a Union, and to draw up laws for its constitution. The election should be conducted on lines indicated under heading B, as being the most convenient on this occasion. Names for election should be submitted to us, duly proposed and seconded, before the meeting.

We have the honour to remain, yours faithfully,

A. R. NELIGAN.
A. H. HOGARTH.
S. E. CRAWFORD.

## View Day, May 13, 1903.

IT was the second Wednesday in May. The sun shone, the fountain played, the Square blossomed with relatives and friends. It was View Day. Were not the resident staff arrayed in all their glory? Beyond doubt it was View Day.

All solemn is the beadle in sombre gown and glittering mace, all solemn the procession—"the Treasurer, Almoner, and Governors"—beadle-announced in every ward. In due state the well-known function is performed, and ward after ward stays hushed the while.

Now burst the pent-up floodgates, and now the living stream is poured into the wards.

Here is the humble dresser, the proud escort of delighted friends, sisters, other people's sisters, so full of questions as he, the great man, scatters crumbs of knowledge gallantly amongst them. Here the lowly clerk, a veritable squire of dames, besieged alike for diagnosis, prognosis, ætiology, treatment—such gallantry, such ingenuity.

Here sits a solemn mite in scarlet bed-gown, the proud possessor of a tight-grasped penny; the sponge-cake that he holds in the other hand has found its way about his cheeks; here he sits surrounded by a group of ardent baby-lovers, like some philosopher, nor answers ever a word.

Flowers fill every space, and the air is laden with their scent. Then tea—cakes and cakelets, chocolates and sandwiches, all shapes and sizes,—the sisters' and the nurses' hospitality forbid one passing.

The Great Hall is visited, and short biographies required of all the portraits.

With what joy are sniffed the subtle perfumes of the dispenser's art, and watched the grinding, rolling, straining, stirring, boiling of the drugs.

Then, too, the X rays that showed our very bones upon the screen. How we lighted gas with our fingers, and gallantly seated on the insulated chair submitted our hair to be made to "stand on end like quills upon the fretful porcupine"!

Nor must a humorous episode be forgot. How well can we picture the becoming *embarras* of the ophthalmic house surgeon when, after removing a foreign body from the eye of a fair American visitor, he was met with "Say, doctor, what do I owe you?" and well imagine the gallantry of his denial of obligation!

Our parting guests are sped. We carry with us the pleasing memory of how beautiful the flowers were in the wards. "Where all is beautiful why try to choose?" View Day is over. Bart.'s is itself again.

## Amalgamated Clubs.

### CRICKET CLUB.

*President.*—Sir William Selby Church, Bart.
*Captain 1st XI.*—W. S. Nealor.
*Secretaries 1st XI.*—W. B. Griffin, G. F. Page.
*Captain 2nd XI.*—A. J. Symes.
*Secretary 2nd XI.*—A. J. Kendrew.
*Committee.*—G. G. Ellett, C. A. Anderson, C. M. H. Howell, H. N. Burroughes.

| *Date.* | | *Opponents.* | *Ground.* |
|---|---|---|---|
| Wed. | May 6 | Trial Game | Winchmore Hill |
| Sat. | ,, 9 | Virginia Water | Virginia Water |
| Sat. | ,, 16 | Henley-on-Thames | Henley |
| Sat. | ,, 23 | M.C.C. | Winchmore Hill |
| Wed. | ,, 27 | Marlow | Marlow |
| Sat. | ,, 30 | Southgate | Southgate |
| Mon. | June 1 | Wanderers | Winchmore Hill |
| Wed. | ,, 3 | Past *v.* Present | Winchmore Hill |
| Sat. | ,, 6 | Waldegrave Park | Winchmore Hill |
| Wed. | ,, 10 | Richmond | Richmond |
| Sat. | ,, 13 | Addlestone | Addlestone |
| Sat. | ,, 20 | Hampstead | Hampstead |
| Sat. | ,, 27 | Dunstable Grammar School | Dunstable |
| Sat. | July 4 | R.I.E.C. | Cooper's Hill |
| Sat. | ,, 11 | | |
| Wed. | ,, 15 | London County C.C. | Crystal Palace |
| Sat. | ,, 18 | Surbiton | Surbiton |

### SECOND XI FIXTURES.

| *Date.* | | *Opponents.* | *Ground.* |
|---|---|---|---|
| Wed. | May 6 | Trial Game | Winchmore Hill |
| Sat. | ,, 9 | Chartered Bank of India | Winchmore Hill |
| Wed. | ,, 13 | St. Thomas's Hospital 2nd XI | Chiswick |
| Sat. | ,, 16 | | |
| Sat. | ,, 23 | Ingatestone Asylum | Ingatestone |
| Wed. | ,, 27 | Guy's Hospital 2nd XI | Winchmore Hill |
| Sat. | ,, 30 | Merchant Taylors' 2nd XI | Bellingham |
| Sat. | June 6 | R.I.E.C. 2nd XI | Cooper's Hill |
| Wed. | ,, 10 | London Hospital 2nd XI | Winchmore Hill |
| Thur. | ,, 11 | Loughton | Loughton |
| Sat. | ,, 13 | Chartered Bank of India | Winchmore Hill |
| Sat. | ,, 20 | St. Thomas's Hospital 2nd XI | Winchmore Hill |
| Sat. | ,, 27 | London Devon 2nd XI | Winchmore Hill |
| Sat. | July 4 | Guy's Hospital 2nd XI | Winchmore Hill |
| Sat. | ,, 11 | Southgate Asylum | Winchmore Hill |
| Sat. | ,, 18 | Hospital Employés | Winchmore Hill |

The Hospital opened their season at Virginia Water on Saturday, May 9th, with a match against the Sanatorium. The match resulted in a win for the Sanatorium by 47 runs.

SCORES.

| ST. BART.'S. | | THE SANATORIUM. | |
|---|---|---|---|
| W. B. Griffin, b Blaber | 27 | Bishop, b Griffin | 10 |
| H. Rimmington, c Bishop, b Meads | 2 | Smith, b Gaskell | 1 |
| L. V. Thurston, b Bishop | 1 | Aries, c and b Gaskell | 12 |
| W. S. Nealor, b Bishop | 6 | Meads, run out | 12 |
| W. H. Hamilton, b Bishop | 2 | W. J. Hill, c Nealor, b Adam | 52 |
| L. L. Phillips, b Aries | 21 | J. K. Kinderley, c Gaskell, b Adam | 13 |
| B. A. Keats, b Aries | 1 | Greig, c and b Adam | 2 |
| J. Gaskell, not out | 29 | T. E. Harper, c Symes, b Rimmington | 1 |
| A. J. Symes, b Blaber | 0 | Robinson, c Hamilton, b Keats | 30 |
| G. H. Adam, b Meads | 9 | Blaber, not out | 21 |
| G. F. Page, st and b Meads | 11 | Stinton, c Page, b Phillips | 3 |
| Extras | 9 | Extras | 8 |
| Total | 118 | Total | 165 |

BOWLING ANALYSIS.

| | Overs. | Maidens. | Runs. | Wickets. |
|---|---|---|---|---|
| Adam | 9 | 1 | 20 | 3 |
| Gaskell | 21 | 1 | 64 | 2 |
| Griffin | 13 | 3 | 35 | 1 |
| Page | 6 | 1 | 8 | 0 |
| Rimmington | 5 | 0 | 13 | 1 |
| Keats | 2 | 0 | 10 | 1 |
| Phillips | 2 | 0 | 4 | 1 |

### ST. BART.'S *v.* M.C.C.

This match took place on Saturday, May 23rd, at Winchmore Hill, and resulted in a win for the visitors by four wickets. W. S. Nealor and K. S. Single were top scorers for the Hospital, with 43 and 38 respectively.

SCORES.

| ST. BART.'S. | | M.C.C. | |
|---|---|---|---|
| W. S. Nealor, c Young, b Carpenter | 43 | D. C. Lee, b Gaskell | 20 |
| K. S. Single, b Dolby | 38 | L. Hulton, st, b Gaskell | 14 |
| W. B. Griffin, b Carpenter | 2 | Carpenter, not out | 62 |
| L. V. Thurston, c Russell, b Young | 12 | B. Bircham, b Page | 5 |
| J. Gaskell, c Hulton, b Carpenter | 5 | W. W. Dean, c Page, b Eckstein | 17 |
| J. Eckstein, b Dolby | 3 | Wolfe-Barry, c Thurston, b Eckstein | 9 |
| C. Elliott, b Dolby | 6 | D. W. Duncan, l-b-w, b Gaskell | 1 |
| B. Keats, c Russell, b Carpenter | 4 | H. Dolby, not out | 6 |
| L. L. Phillips, not out | 0 | Young, Russell, H. Hulton } did not bat. | |
| G. F. Page, run out | 0 | | |
| A. J. Symes, b Dolby | 0 | | |
| Extras | 17 | Extras | 7 |
| Total | 130 | Total | 139 |

BOWLING ANALYSIS.

| | Overs. | Maidens. | Runs. | Wickets. |
|---|---|---|---|---|
| Gaskell | 12 | 0 | 40 | 3 |
| Eckstein | 6 | 1 | 28 | 2 |
| Page | 10 | 5 | 20 | 1 |
| Griffin | 9 | 0 | 34 | 0 |
| Phillips | 1 | 0 | 3 | 0 |
| Single | 1 | 0 | 2 | 0 |
| Thurston | 1 | 0 | 1 | 0 |

### ST. BART.'S *v.* LONDON HOSPITAL.

The first round of the Cup ties was played at Honor Oak on Monday, May 25th, and resulted in a win for Bart.'s by 57 runs. London batted first on a very fast wicket, and totalled 109, Bart.'s obtaining 166. C. A. Anderson played an admirable innings of 57.

SCORES.

| LONDON. | | ST. BART.'S. | |
|---|---|---|---|
| E. A. Ellis, b Griffin | 1 | W. B. Griffin, c Jacob, b Ellis | 13 |
| A. K. Moore, c sub, b Page | 0 | L. V. Thurston, l-b-w, b Thomas | 14 |
| W. J. Gibson, b Page | 0 | K. S. Single, run out | 5 |
| N. B. V. Jacob, l-b-w, b Gaskell | 31 | W. S. Nealor, b Ellis | 5 |
| H. A. Barnes, b Griffin | 5 | C. A. Anderson, b Barnes | 57 |
| J. A. Smith, run out | 36 | P. R. Parkinson, b Jacob | 6 |
| J. H. Thomas, b Page | 5 | J. Eckstein, st, b Ellis | 10 |
| A. H. Jacob, c Single, b Page | 1 | J. Gaskell, b Barnes | 16 |
| R. B. Sparrow, b Gaskell | 22 | C. Elliott, l-b-w, b Barnes | 2 |
| H. F. Home, b Griffin | 0 | G. F. Page, not out | 15 |
| H. Gibson, not out | 0 | A. J. Symes, c Gibson, b Smith | 0 |
| Extras | 3 | Extras | 23 |
| Total | 109 | Total | 166 |

BOWLING ANALYSIS.

| | Overs. | Maidens. | Runs. | Wickets. |
|---|---|---|---|---|
| Page | 13 | 3 | 42 | 4 |
| Griffin | 9 | 0 | 35 | 3 |
| Gaskell | 5 | 0 | 21 | 2 |

## The Rahere Lodge, No. 2546.

A MEETING of the Rahere Lodge, No. 2546, was held at Frascati's Restaurant, Oxford Street, W., on Tuesday, May 12th, W. Bro. Holden, M.D., W.M., being in the chair. Mr. William Fairbank and Bros. Launcelot Wilkinson and F. L. Provis were elected members of the Lodge. A donation of fifty guineas to the Royal Medical Benevolent College at Epsom was voted unanimously. W. Bro. Ernest Clarke, F.R.C.S., was elected Worshipful Master for the coming year, while W. Bro. Clement Godson, M.D., was re-elected Treasurer. A considerable number of the brethren subsequently dined together.

## Examinations.

UNIVERSITY OF CAMBRIDGE.

THE following have completed the examinations for the degrees of M.B., B.C.:—H. N. Burroughes, W. B. Crowfoot, B. Hudson, H. L. P. Hulbert, P. W. Leathart, G. W. Micklethwait, F. Whitaker, H. L. Wilson.

CONJOINT BOARD.

The following have completed the examinations for the diplomas of M.R.C.S., L.R.C.P.:—F. Whitaker, P. W. Leathart, A. H. D. Knight, J. G. Slade, H. F. Bodvel Roberts, B. Hudson, H. L. Wilson, W. H. Hamilton, W. C. F. Harland, W. B. Crowfoot, T. P. Baldwin, H. W. James, C. M. H. Howell, G. E. Aubrey, R. J. Hanbury, C. R. Keed, H. A. Kellond Knight, C. G. Kingston, H. Serpell.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.

*First Examination for the diploma of Fellow.*—W. G. Ball, F. A. Rose, J. C. Mead, R. C. Elmslie, L. Noon, R. A. Bowling, H. P. Gibb, C. H. Cross, R. Jamison.

*Final Examination for the diploma of Fellow.*—E. H. Hunt, A. J. Fairlie Clarke, F. E. Murray, — Dickie, R. F. Moorshead, R. H. Whitaker, E. A. Peters, N. Maclaren.

UNIVERSITY OF LONDON.

*M.B. Examination—2nd Division.*—S. B. Atkinson, A. F. Hamilton, T. H. Harker, C. C. Robinson, E. C. Williams.

UNIVERSITY OF DURHAM.

*First Examination.*—C. G. Kemp (second-class Honours), H. E. Bloxsome (Chemistry and Physics only).

*Third Examination.*—F. W. Kemp.

*Final Examination for M.B., B.S.*—P. M. Rivaz.

*Diploma in Public Health.*—R. Bigg, M.B., B.S.

## Appointments.

AUBREY, G. A., M.R.C.S., L.R.C.P., appointed Surgeon to the SS. "Inkosi."

* * *

BROWN, C. R. V., M.R.C.S., L.R.C.P., appointed Surgeon to the SS. "Umvolosi."

* * *

COLEMAN, F., M.R.C.S., L.R.C.P., L.D.S.(Eng.), appointed Dental Surgeon to the Metropolitan Hospital.

* * *

CONOLLY, N. A. W., M.R.C.S., L.R.C.P., appointed Resident Obstetric Officer to the Bristol Royal Infirmary.

* * *

COOK, J. B., M.B., B.Ch.(Vict.), appointed House Surgeon to the Royal Alexandra Hospital for Children, Brighton.

* * *

HAMILTON, A., M.B.(Lond.), M.R.C.S., L.R.C.P., appointed Surgeon to the SS. "Rewa."

* * *

WHITAKER, L. EDGAR, M.R.C.S., L.R.C.P.Lond., appointed Certifying Factory Surgeon for the parish of Diss and district, Norfolk.

* * *

WILLIAMS, E. C., M.B.(Lond.), M.R.C.S., L.R.C.P., appointed Junior House Surgeon to the Royal Southern Hospital, Liverpool.

## New Addresses.

ADAMSON, H. G., 9, Weymouth Street, W.

ARKWRIGHT, JOSEPH A., Ridgway, St. Margaret's-at-Cliffe, near Dover.

BURROWS, H., Caragh, Lyford Road, Wandsworth Common.

LAWRENCE, B. E., Teynham, Kent,

LEONARD, N., Laurence House, Valkyrie Road, Westcliff-on-Sea.

SANDILANDS, J. E., 9, Sussex Villas, Kensington, W.

SMITHSON, ARTHUR E., Major R.A.M.C., Barberton, Transvaal.

## Marriage.

STORRS—SIMON.—On April 30th, at St. Peter's, Eaton Square, by the Rev. W. T. Storrs, B.D., Vicar of Sandown, Isle of Wight, assisted by the Rev. E. F. Russell, of St. Alban's, Holborn, and the Rev. A. H. Simms, Vicar of Holy Trinity, Ely, William Townsend Storrs, M.R.C.S., L.R.C.P., of Tunbridge Wells, second son of the late Robert Storrs, M.R.C.S., of Doncaster, to Maude Blanche, only daughter of Mr. and Mrs. Alfred Simon, of the Durnals, Donnington, Berks, and the Hans Crescent Hotel.